

Y-12

OAK RIDGE Y-12 PLANT

MARTIN MARIETTA

Y/WP-0017
VISUALS

AIRBORNE URANIUM AND BERYLLIUM
REAL-TIME WORKPLACE MONITORING
(ENDEAVOR 601)

John Hiller
Y-12 Development Division

Date of Issue: November 7, 1991

Waste Stream Managers Meeting
Oak Ridge Y-12 Plant
Oak Ridge, TN
November 7, 1991

Prepared by the
Oak Ridge Y-12 Plant
P.O. Box 2009, Oak Ridge, Tennessee 37831
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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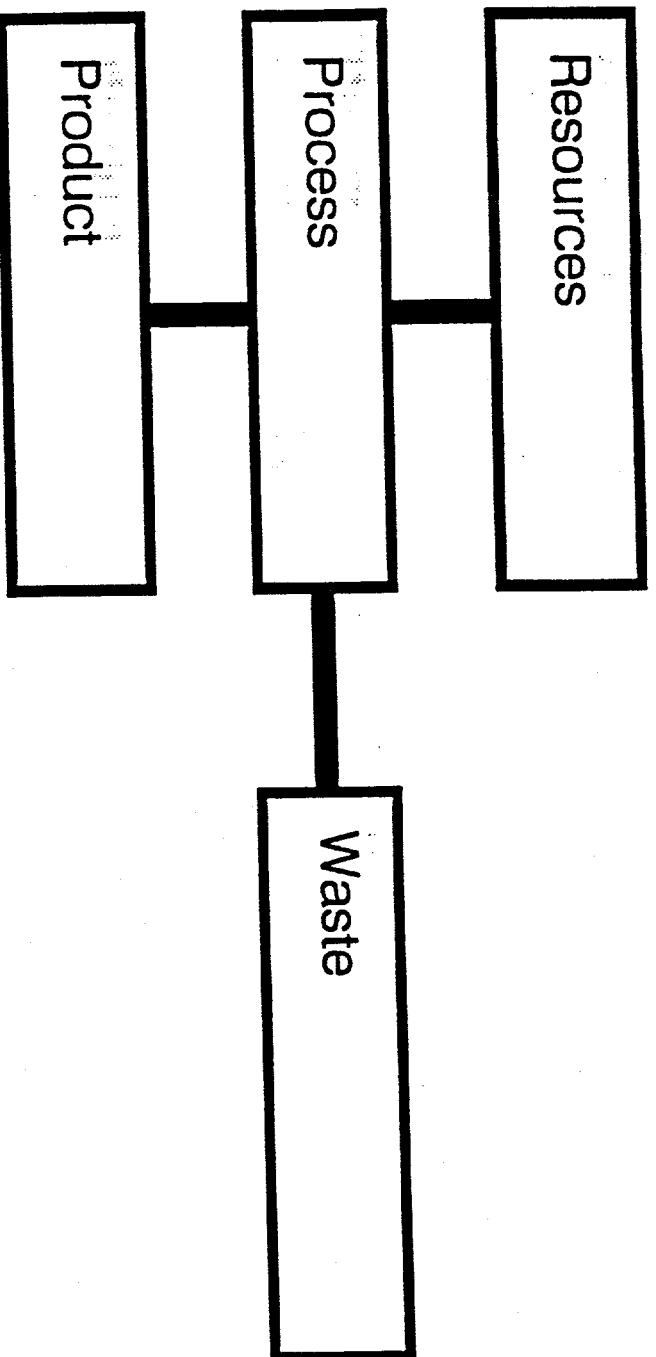
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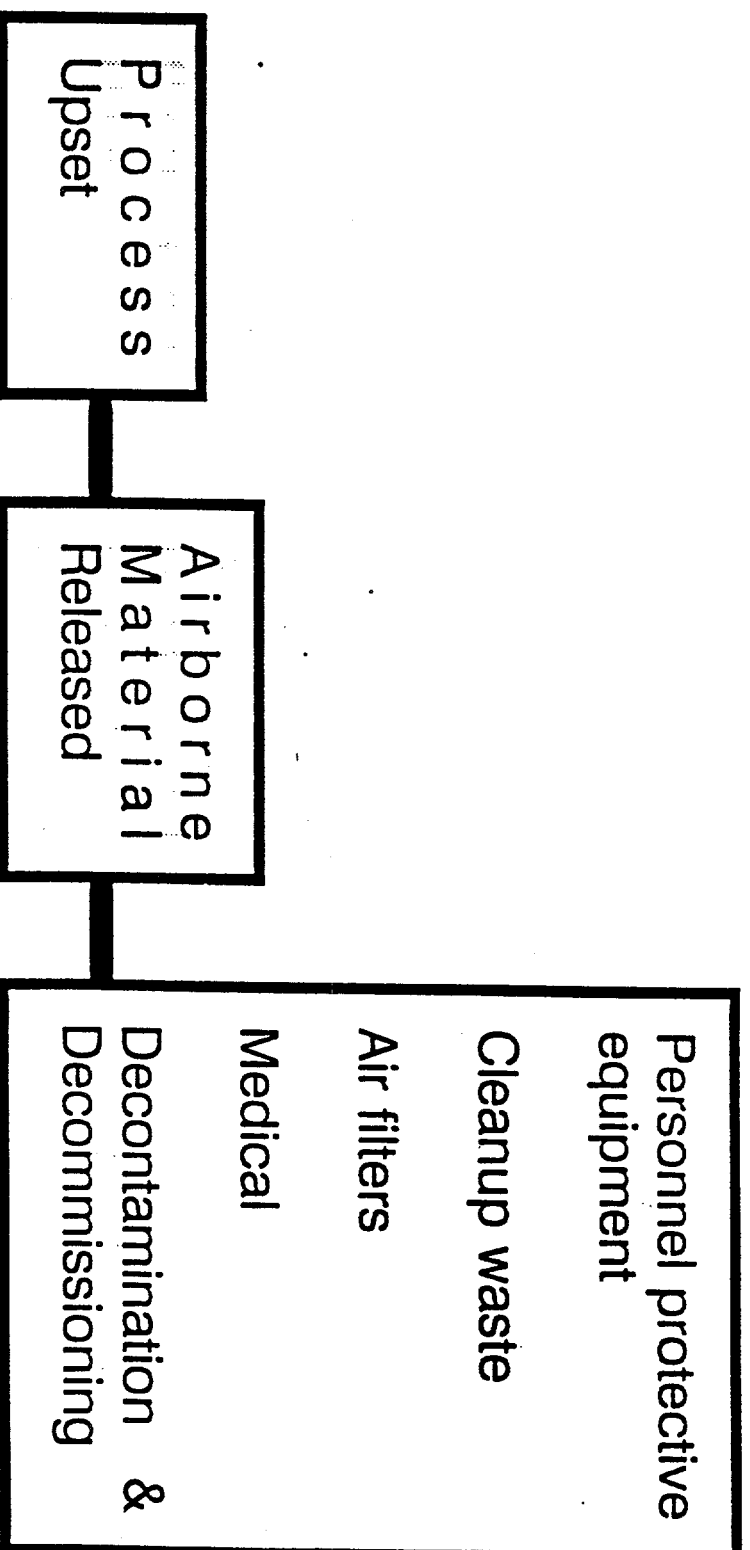
Outline

- How monitors fit into the waste minimization strategy
- Beryllium monitor status and plans
- Uranium monitor status and plans

A Generic Process



A Generic Process Upset



Process Management

<u>Operation</u>	<u>---Waste</u>	<u>Generation---</u>
	Routine Operation	Process Upset
Assume Risk	Low volume	High volume
Avoid Risk	High volume	High volume
Monitor	Low volume	Low volume

Secondary Benefits

- ALARA--Worker exposure is effectively minimized
- Productivity--Workers are not encumbered with unnecessary protective equipment. Less need for changes of clothing.
- Utility Use--Can optimize air exchange rates
- Health--Workers are not exposed to unknown airborne hazards
- Other--Continuous monitoring is less expensive than discrete sampling and subsequent laboratory analysis.

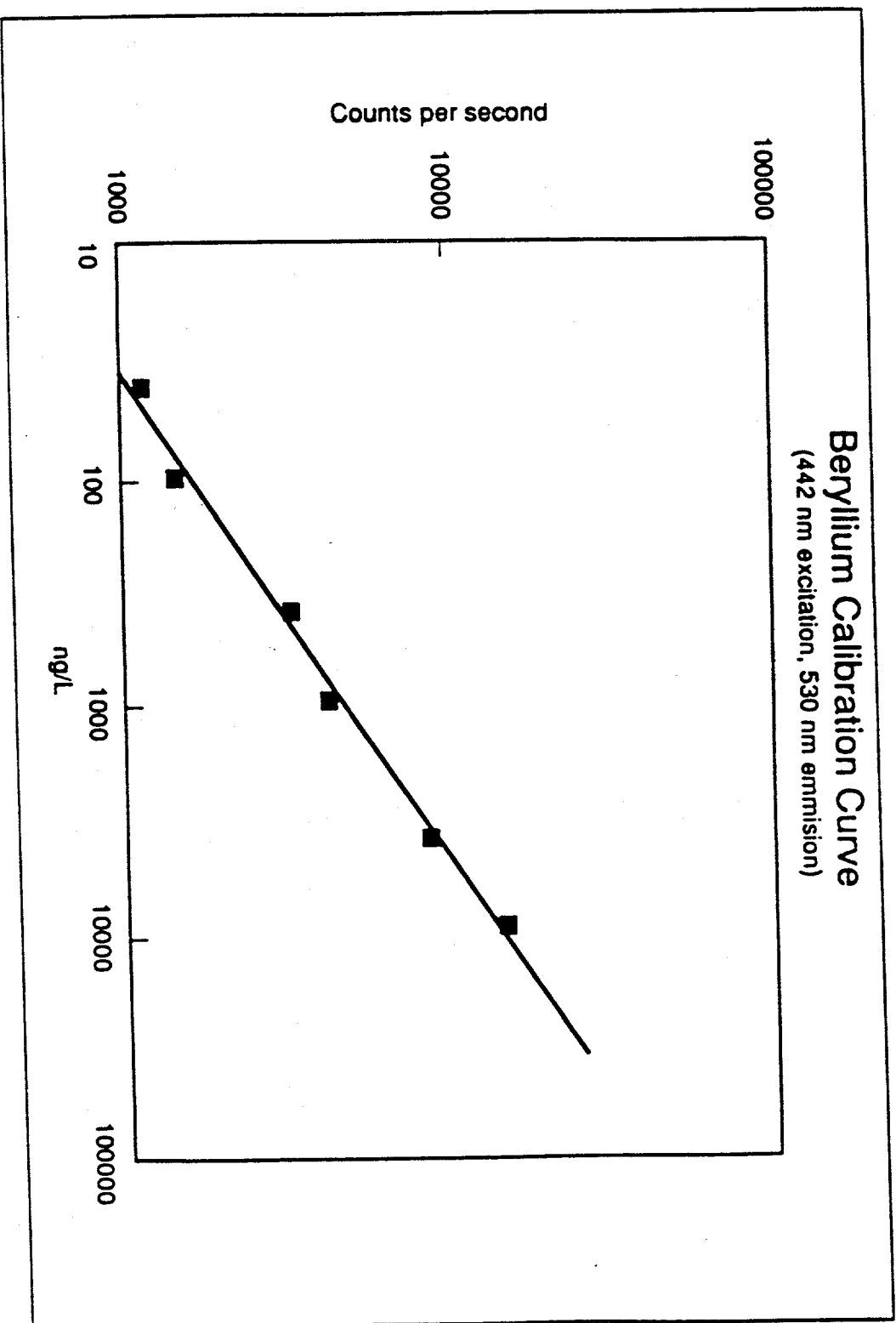
Task Overview

- The principal objective of this activity is to develop instrumentation which will prevent the formation of waste.
- The specific activities are to develop monitors for determining beryllium and (total) uranium in air.
 - Sensitivity to meet regulator limits
 - Speed sufficient to mitigate the effects of an excursion
 - Monitors to require minimal attention

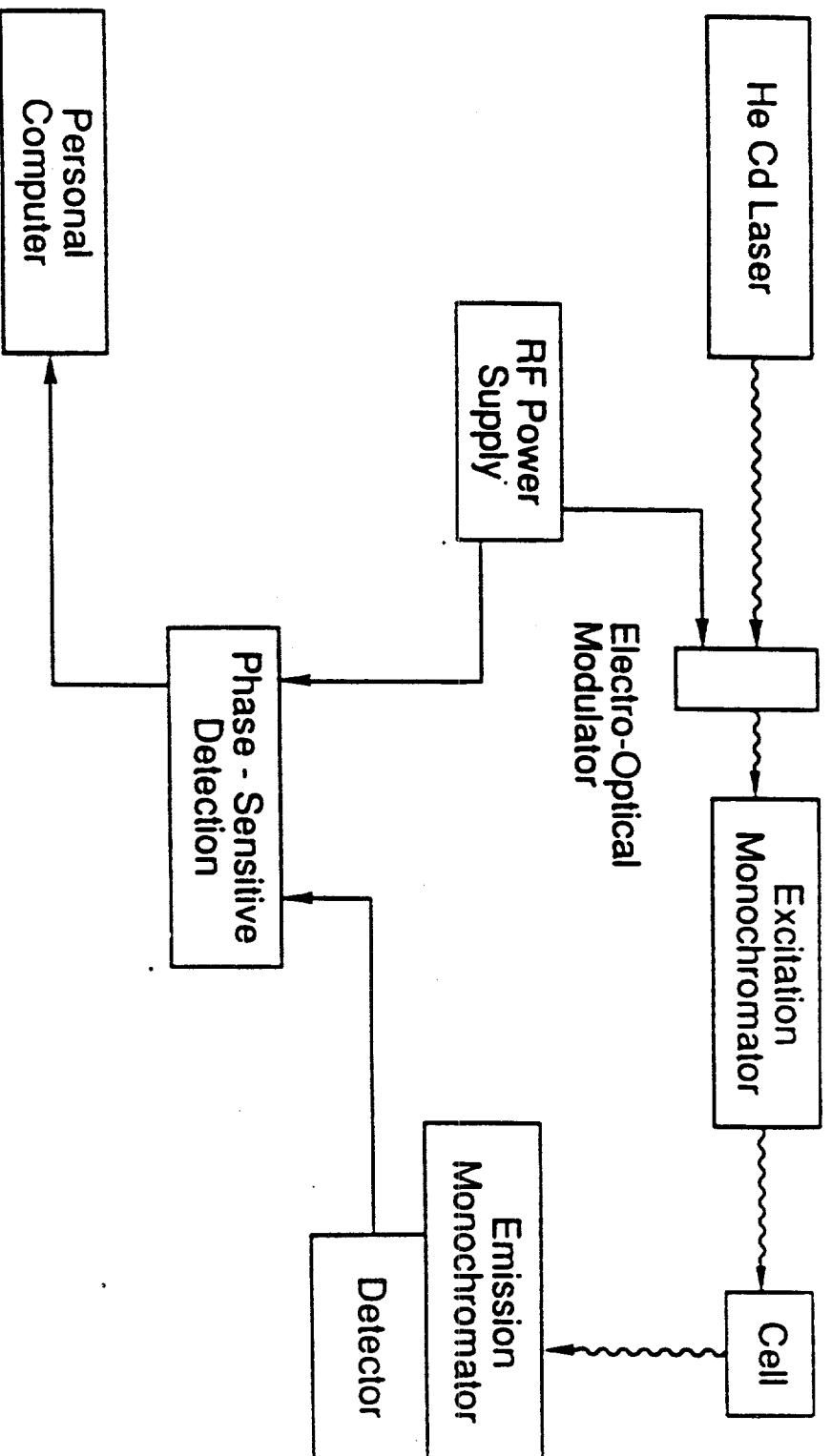
Beryllium occupational exposure limits

Agency	Species	Limits	Basis	Sampling Rate
NIOSH	Beryllium	0.5 $\mu\text{g}/\text{m}^3$	8 h TWA	2500 mL/min
NIOSH	Beryllium & compounds	0.5 $\mu\text{g}/\text{m}^3$	1 h	1500 mL/min
OSHA	Beryllium & compounds	2 $\mu\text{g}/\text{m}^3$	8 h TWA	2000 mL/min
OSHA	Beryllium & compounds	25 $\mu\text{g}/\text{m}^3$	30 min	2000 mL/min
OSHA	Beryllium & compounds	5 $\mu\text{g}/\text{m}^3$	Ceiling	2000 mL/min

Beryllium Working Curve



Beryllium Monitor Sketch



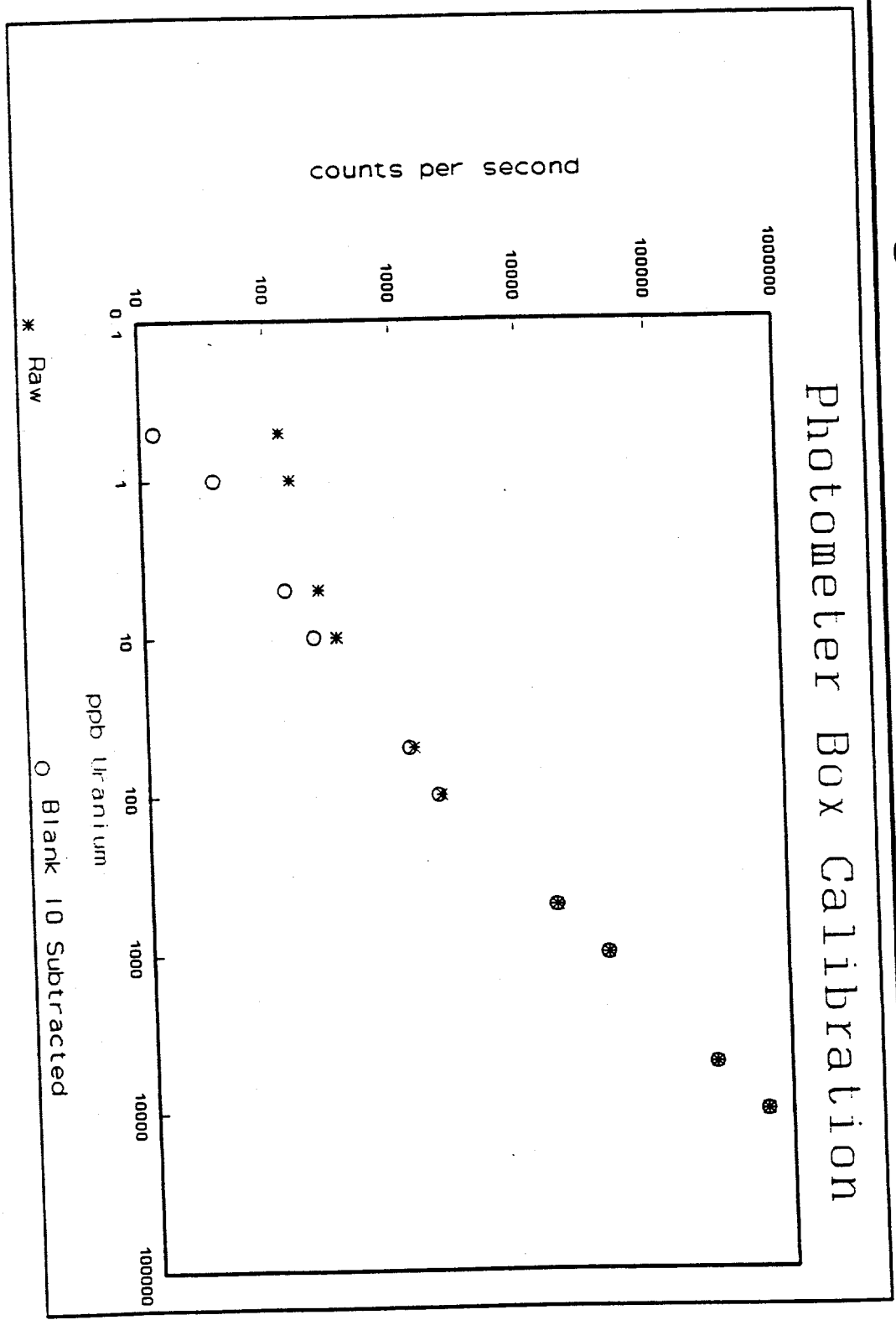
Analyzer Miniaturization:

- Replace He Cd laser with frequency—doubled diode laser
- Replace RF power supply with a pulse source feeding the diode laser
- Replace the excitation monochromator with a narrow bandpass filter
- Replace the detection monochromator with a wide bandpass filter
- Replace discrete electronics with application specific integrated circuit

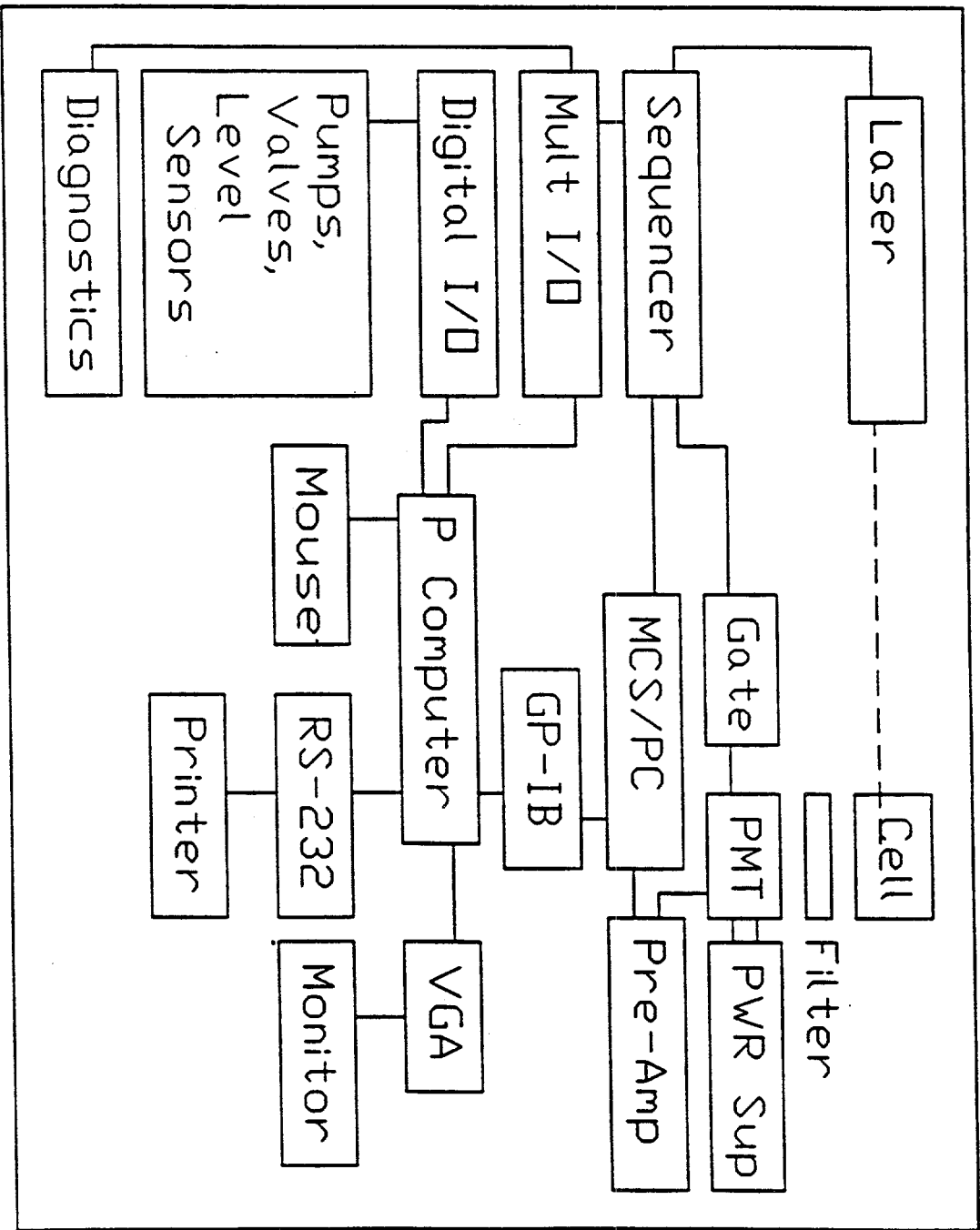
Uranium occupational exposure limits.

Agency	Species	Limits	Basis	Sampling Rate
OSHA	Uranium (insoluble compounds)	0.2 mg/m ³	8 h TWA	2000 mL/min
OSHA	Uranium (insoluble compounds)	0.6 mg/m ³	15 min ceiling	2000 mL/min
OSHA	Uranium (soluble compounds)	0.05 mg/m ³	8 h TWA	2000 mL/min
DOE	Activity	44 d/(min m ³)	8 h TWA	

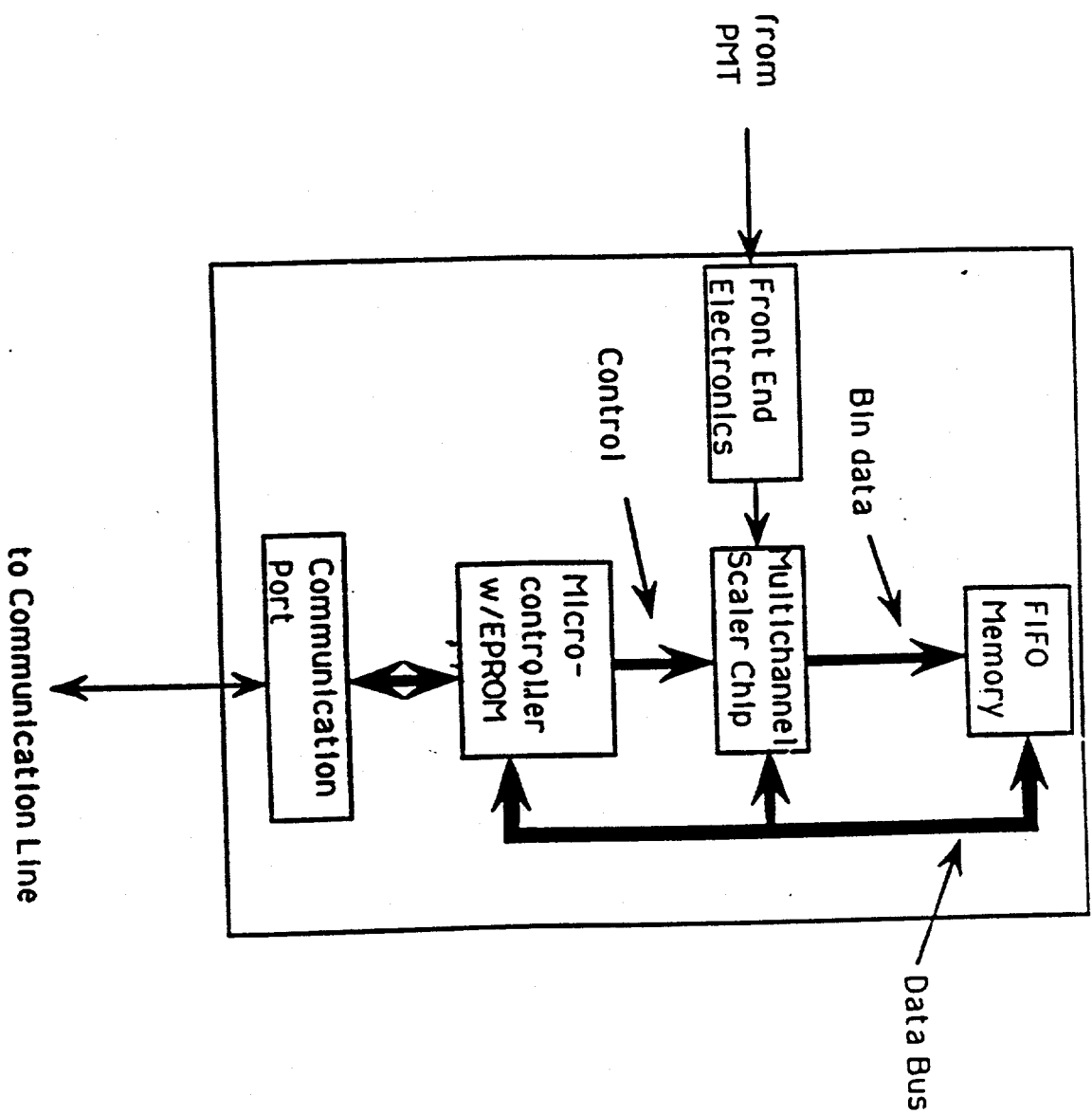
Uranium Working Curve



Uranium Analyzer Sketch



Uranium Analyzer Application Specific Integrated Circuit



Schedule

- Fiscal Year 1992
 - Build prototype instrument
 - Initiate field testing
- Fiscal Year 1993
 - Complete field testing
 - Incorporate field testing experience in engineering prints
 - Generate supporting documents (operation, test, calibration, maintenance, etc.)

Investigators

MG Duncan

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JJ Lew

LR Mooney

JE Rogers

EW Walker

